March 7, 1933. C. W. HICKS 1,900,111

SOUND AMPLIFIER

Filed Aug. 9, 1927

Fig. 1.

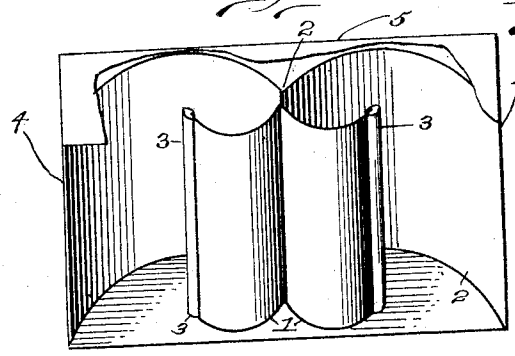


Fig. 4.

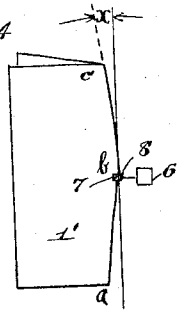


Fig. 2.

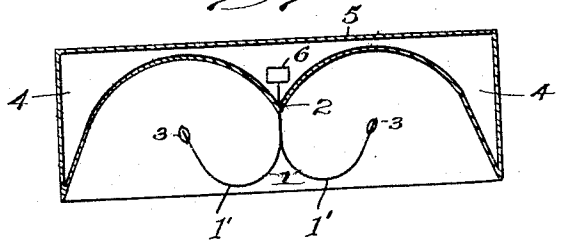
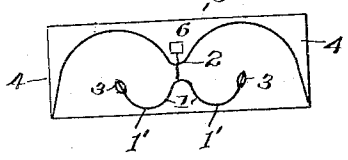


Fig. 3.



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Patented Mar. 7, 1933 1,900,111

UNITED STATES PATENT OFFICE

CHESTER W. HICKS, OF HAMPTON, VIRGINIA

SOUND AMPLIFIER

Application filed August 9, 1927. Serial No. 211,755.

This invention relates to sound amplifiers and has for its object improved reproduction of sound by the provision of a device applicable for radio reproduction of sound or for any case where a pulsating current impulse responsive device may be used to actuate a vibratory diaphragm to produce sound.

A further object of the invention is to provide a device for producing sound waves and while amplifying these waves to provide a directional guiding means for all the waves generated.

In the case of the conventional type of small metallic diaphragm as used in head sets or units for horns, one side of the diaphragm is subjected to the rebounding waves from a cramped compartment. This produces distortion which is objectionable especially when amplified. With the small metallic diaphragm a horn is necessary to amplify the sound to loud speaker volume and this has its own limitations. The horn type of speaker has given away largely to the cone type in which a large diaphragm of parchment is used to produce the desired volume directly.

I have discovered that by moving a diaphragm of blotting paper in sliding friction with the air there may be produced sound waves having a tone of exceptional quality. I therefore propose to provide a device comprising the combination of a pulsating current impulse operated diaphragm or membrane rolled in such a manner as to present a contour of a plurality of substantially semicylindrical convolutions. And I may also arrange same adjacent to a sound deflector in such relation as to produce both a directional and amplifying effect on the sound waves on one or all sides of the moving diaphragm.

With the foregoing and other objects in view, the present invention consists in the combination of parts and in the details of construction hereinafter set forth in the following description and appended claims, certain embodiments of the invention being illustrated in the accompanying drawing, in which:

Fig. 1 is a diagrammatic view in perspective of the device with the cabinet partially cut away, showing the roll diaphragm and its relation to the sound deflector.

Fig. 2 is a diagrammatic view in cross section through the device as shown in Fig. 1.

Fig. 3 is a diagrammatic view similar to Fig. 2 showing a modified form of roll diaphragm.

Fig. 4 is a detail diagrammatic view in side elevation of the diaphragm with the electromagnetic unit attached thereto.

Referring more particularly to the drawing there is shown in Fig. 1 a cabinet having sides 4 with a plurality of rearwardly curved interior faces 1 forming a partition 2 integral with the remainder of the cabinet and between the two sides 4. The partition is pointed and so formed as to function efficiently as a sound deflector.

The vibrating diaphragm 1′ in this invention consists in a suitable type of fibrous material. Much care must be taken in avoiding the use of one which is so thin or light that it would rattle or so thick or dense that it would fail to amplify low quality tones. I have found certain of the best grades of blotting paper to be of the most efficient density, because such blotting paper embodies the necessary low inherent elasticity or capacity for preventing the production of sound by self vibration.

In the use of such blotting paper, I prefer to employ the same in its normal commercial condition, and without changing or increasing its density as by impregnating the same either in whole or in part with any agent which would have the effect of increasing the density of the blotting paper in any material degree.

As shown in Fig. 1 the fibrous diaphragm 1′ is formed into two convolutions of substantially semicylindrical appearance. The two lateral ends of the diaphragm have a suitable rigid non-vibrating member 3 slipped over them or otherwise suitably attached to prevent instability of the diaphragm.

The usual actuating unit such as an electromagnetic unit 6 may be attached to the diaphragm in any suitable manner such as shown diagrammatically in Fig. 4, in which a clamp 8 and bolt 7 is shown attached at

"b" which may or may not be the vertical center of the diaphragm. It will be observed that the ends "a" and "c" recede from the vertical line by an amount equal to the angle "x". This angle may however be zero degrees.

Fig. 3 shows a modified form of continuous curved diaphragm roll in which the electro-magnetic unit may be connected thereto substantially as shown. The form of the central point of the curved interior faces 1' which form the partition 2 which central point in this instance is curved instead of pointed is also optional.

The relationship of the deflecting partition with curvature effect and the conformity of the convolutions of the vibratory diaphragm when actuated by the actuating unit, not only amplifies the radio reproduction of sound but directs the sound waves in the proper channels in such a manner as to prevent the rebounding of waves against the diaphragm and the consequent distortion in sound reception or reproduction. This is accomplished primarily by means of the curvature of the partition or sound deflector 2 which acts as a sound baffle, and its particular curvatures which extend outwardly past the ends of the roll diaphragm 1' by a considerable margin. Thus there is derived the maximum efficiency in sound amplification and sound reproduction with the minimum amount of inherent interference or distortion.

A more specific statement of the foregoing description is that the curvature of the surfaces 1 of the deflecting partition 2, when taken in connection with the curvature of the diaphragm 1', forms substantially two opposed spiral structures, each of substantially a single convolution, each of which spiral structures has one of the stiffening strips 3 for a center. This in effect produces individual spiral structures in which substantially one half of the spiral convolution vibrates under the influence of an actuating unit while the other half of the spiral convolution acts as a deflector and amplifier for the sound waves produced by the vibrations of the first mentioned half of the convolution of the spiral. The result of this spiral formation is the maximum of amplification and deflection of the sound waves with practically zero interference or distortion.

I claim:

1. A device of the character described including a deflecting partition having curved faces meeting each other to form a point and a curved fibrous diaphragm having a stiffening member at each of its extremities, the said deflecting partition when taken in connection with the curvature of the diaphragm forming substantially two opposed spiral structures each of substantially a single convolution, and having one of the said diaphragm stiffening members for a center, and an actuating unit connected to said diaphragm, the whole arranged in such manner that substantially one half of each spiral convolution vibrates under the influence of the actuating unit, while the other half of each spiral convolution deflects and amplifies the sound waves produced by the vibrations of the first mentioned half of the spiral convolution, substantially as described.

2. A device of the character described including a deflecting partition having curved faces, a curved fibrous diaphragm having a stiffening member at each of its extremities, the said deflecting partition when taken in connection with the curvature of the diaphragm forming substantially two opposed spiral structures each of substantially a single convolution, each of which spiral structures has one of the stiffening strips for a center and an actuating unit connected to said diaphragm, the whole arranged in such manner that substantially one half of each spiral convolution vibrates under the influence of the actuating unit, while the other half of each spiral convolution deflects and amplifies the sound waves produced by the vibrations of the first mentioned half of each spiral convolution, substantially as described.

3. A device for the reproduction of sound including a vibratory diaphragm made of blotting paper whereby it has a low inherent elasticity, said diaphragm being rolled into two substantially partially cylindrical formations having central meeting edges, actuating means for impressing pulsations on the two partially cylindrical formations at their central meeting edges and means for mounting the diaphragm and its actuating means.

4. A device of the character described including a flexed vibratory diaphragm of two roll formations having two edges of the rolls meeting centrally of the diaphragm for attachment to an actuating unit, and a deflecting partition arranged in rear of the vibratory diaphragm, said deflecting partition having curved faces to receive the sound waves from the rear of the diaphragm and deflect the same in the general direction of the sound waves from the front of the diaphragm.

In testimony whereof I affix my signature.

CHESTER W. HICKS.